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ABSTRACT

A major problem in the use of films in instruction is to get the right film to the right teacher when he wants it and needs it, and to do all this at a minimum cost. This paper presents a view of film distribution systems in terms of two interrelated subsystems: a logistic subsystem and a behavioral subsystem. The logistic subsystem consists of those factors which affect the number of bookings that a library completes. The behavioral subsystem consists of those factors which affect the demand for films. The paper proposes that a program budget approach be used to minimize costs. A program budget would break down allocations according to the independent factors affecting a system's operation. (JY)

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RELATING AGENCY OBJECTIVES TO BUDGET ORGANIZATION: FACTOR BUDGETING FOR AN EDUCATION FILM LIBRARY

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Technology is beginning to force a redefinition of the teacher's role. Audiovisual aids--films, filmstrips, television, tapes, language labs, etc.--now permit a variety of information content to be presented in a number of formats. As the saying goes, there are now available several media, which can be used to convey the same message.

Once the subject matter has been decided, the teacher must become expert in deciding which mix of media is most appropriate for communicating the desired information. The message, of course, may be designed either to motivate and stimulate the students or to convey principles, data or concepts. This then is the teacher's new role, the role of the decision-maker selecting the best mix of media and content in an effort to maximize learning. It is, as Edward Clark (The Antiochian, Sept. 1968) observes, a drastic shift in the teacher's role--a shift from a mere information giver to a designer of a wide range of learning experiences.

It seems clear that film is one of the most widely used and most strongly preferred of the audiovisual aids. There are, however, two major problems with films. First, although there are over 26,000 educational titles currently on the market, there are areas of the curriculum that are sorely lacking in terms of

appropriate films. This seems particularly true in the areas of mathematics, language and English (Godfrey, 1967, p. 143). A second major problem--and this is the one of immediate concern here--is how to get the right film to the right teacher when he wants it and needs it, and to do all this at a minimum cost. This, in simplified terms, is the problem of distribution. And, when one is considering jurisdictions like Ontario, with about 100,000 teachers and more than forty education-owned film libraries, distribution becomes a complex problem and an expensive enterprise.

It seems appropriate to view film distribution systems in terms of two interrelated subsystems; a logistic subsystem and a behavioural subsystem (See attached diagram). The logistic subsystem consists of those factors which affect the number of bookings that a library completes. The behavioural subsystem consists of those factors which affect the demand; demand is defined as the number of film requests submitted by teachers. The output of these two subsystems, that is, the number of bookings and the number of requests, comprises one of the traditional indicators of a film library's effectiveness, namely, the booking rate. The booking rate, of course, is computed by dividing the number of bookings by the number of requests.

The remainder of this paper will discuss briefly: 1) the logistic subsystem, 2) the behavioural subsystem, and 3) the interrelationship of the two subsystems. Finally, an attempt will be made to show the possible linkages between a theory of film distribution and factor budgeting.

1. THE LOGISTIC SUBSYSTEM

The logistic system has been elegantly described by Oxhandler and Christen (1967). As previously mentioned, the output of this system is the number of bookings. The demand is treated as an exogenous parameter--it remains constant throughout a simulated experiment.

When the demand is constant, the booking rate, by definition, is solely determined by the number of bookings. Now, the number of bookings is empirically related to two factors; the number of prints and the length of the shipping cycle. While the most popular technique for increasing the booking rate is to increase the number of prints, the Oxhandler and Christen simulation demonstrated that there are occasions when a shift in the shipping time may be the most economical strategy. For example, during one simulated experiment the central library was shipping films all over New York State, receiving 134,000 requests a year and booking 85% of them. Delivery and return of films was accomplished by the post office with a two to seven day shipping time depending on the distances.

If the manager wanted to raise his booking rate from say, 85% to 95%, he could do so by purchasing an additional 2,867 prints. At an average price of $150 per print, (a five year life for each print) and a $1.00 per print mailing

cost, the cost of moving from an 85% to a 95% booking rate would come to about $98,000 per year.

A 95% booking rate could also be met if the shipping time was reduced to a two-day maximum. This, of course, would mean purchasing or renting trucks to deliver the films. However, these trucks would eliminate the $114,000 spent on delivering the prints that were previously delivered by the post office. By some rather straightforward arithmetic it is calculated that a truck system should be purchased if the cost is less than $212,000 ($86,000 not spent on new prints, $12,000 not spent on distributing the new prints and $114,000 not spent on distributing the old prints by mail). This truck system would have to deliver 128,000 bookings to all locations in two days or less in order to be competitive with the print purchase strategy.

While the cost description may be a bit difficult to follow the point is simply that the Oxhandler and Christen simulation suggests that decreasing the shipping cycle--which increases the number of times prints are used per year (the turnover rate)--is, at times, a viable alternative strategy to increasing the number of prints per title.

2. THE BEHAVIOURAL SUBSYSTEM

The strength of the Oxhandler and Christen work is its explicitness. Its weakness, however, is its treatment of demand as an exogenous parameter.

The demand for films, as measured by the number of requests submitted by teachers, is the output of what was earlier referred to as the behavioural subsystem. The number of films that a teacher requests is a function of a large number of factors. Many of these factors, such as age and sex, are out of the control of those educational authorities concerned with a.v. policies at the local level. Therefore, they are not of direct concern to our effort. Many of these factors, however, are <u>within</u> the control of the local authorities, and do have a significant effect on teacher request behaviour.

There are at least seven factors which we believe affect teacher request behaviour. They are:

1. Availability of equipment
2. Number, by level and seasonality, of titles
3. Teacher lead-time
4. Ease of Ordering
5. The hold-time
6. Information
7. Training

There is substantial evidence that teachers will request more films as the psychological costs of ordering and using these films decrease. The ideal film distribution system is one which eliminates all resistance, all psychological costs, resulting from unavailable equipment, a shortage of titles, etc. As all systemic resistance is eliminated, the number of film requests a teacher submits approaches the number of films the teacher requires. For requirements will equal requests only when the system is frictionless, free from psychological costs. Well, such an ideal system is much like the physicist's perfect vacuum in which all resistance is eliminated: strictly a mental construct.

Conceptualizing film systems in terms of a logistic and a behavioural subsystem leads us to a new criterion--a new operational objective for film distribution systems, namely, the Requirement Booking Rate (Alexander, 1970). This objective tells us that a distribution system is "perfect" only when 1) teachers receive all of the films they request, and 2) when teachers request all of the films they require.

When teachers receive all of the films they request, the booking rate is 100%. When teachers request all of the films they require, then the demand is equal to requirements. When both of these things happen simultaneously (the

booking rate is 100% and demand is equal to the requirements), then the Requirement Booking Rate is 100%. When the Requirement Booking Rate is 100%, the distribution system is operating with 100% effectivenss.

3. THE INTERRELATEDNESS

The logistic and the behavioural subsystems are interrelated in at least two ways. First, the booking rate may operate on the number of requests in much the same manner as a reinforcement schedule in an operant-conditioning psychological experiment (a la Skinner). Clearly, a booking rate that drops too low will rapidly extinguish a teacher's request behaviour. No teacher will order films if he seriously believes the probability of receiving the film is zero. By the same token, increases in the booking rate may be viewed as reinforcing teacher request behaviour and thus lead to an increase in the number of requests submitted. Now, if there actually was a rapid increase in requests it would result in a lowering of the booking rate, which, in turn, would generate a reduction in the number of requests. It is possible, then, that the booking rate and teacher requests could oscillate up and down, up and down. Here then, would be a negative feedback mechanism of the same type found in a thermostat.

A second way in which the two subsystems are interrelated is through the hold-time or use-time; the length of time that elapses between the receipt of the films by the teacher and the return of the film by the teacher. In the behavioural system the hold-time is frequently the only period for previewing films. In the

logistic system, the hold-time is a component of the shipping cycle.

Hold-times that are too short will lead to teacher discontent, which may well be manifested in a reduction of requests. Hold-times that are too long, on the other hand, reduce turnover by tying up films that could be used by other teachers. This reduction in the turnover of films reduces the booking rate and, as previously mentioned, the booking rate is one obvious factor contributing to changes in the number of requests.

4. RELATION STATEMENTS FROM A PROGRAM BUDGET

Hopefully, this brief sketch gives a rough idea of the kind of theory we are trying to construct. In order to transform this frame of reference we have presented into a modest theory for scientific management, it is necessary to hypothesize and test relation statements. It is one thing to say that teacher use will increase with decreases in the lead-time, increases in the booking rate, or increases in the number of titles. It is quite another thing, yet quite necessary, to say exactly how much those increases will be. A manager, after all, is not interested in hearing that more prints will increase his booking rate. For one thing, he already knows that. He wants, or he should want, guidance on that unique mix of factor investments which will result in the highest possible increase in his Requirement Booking Rate, given, of course, the budget constraints imposed on him. Should he spend all of his budget on new titles, 50% on new titles and 50% on prints of already existing titles, or should he spend all of his budget on a better classification system?

There are two basic types of study designs by which one could test the input-output relationships of a film distribution system; cross sectional studies, or longitudinal studies.

Cross sectional data can be used, in many cases, to infer the kinds of changes that will take place through time. However, such inferences depend, in large part, on very rigorous statistical controls. In the absence of such controls one may end up drawing the kinds of conclusions suggested in a study of the Atlanta, Georgia school system (Burkhead, J., et al., 1967). The study data suggested this rather bizarre proposition: increases in per pupil expenditures lead to <u>increases</u> in the drop-out rate. As the authors of the Atlanta study were quick to note, this finding was the consequence of invalid ceteris paribis assumptions. Their sample included both vocational and regular high schools. The vocational schools, with all of their elaborate equipment, ranked highest on per pupil expenditures. But vocational schools also attract larger proportions of students from lower income homes. Drop out rates, of course, are strongly associated with social class.

When testing a relationship between per pupil expenditures and school drop-out rates it is necessary to hold the social class mix constant. By the same token, when testing an input-output relationship, whether the input is the number of titles, prints or equipment, it is necessary to be able to hold all other inputs constant. The problem with a cross sectional sample then, is

that it probably would not be large enough to test the many variations of interest. Even if we gave only three values to each factor- high, medium, and low - there would still be more than 14,000 possible states of the system (3^9).

An alternative design to the cross-sectional, and one which we are proposing, is a total population longitudinal study--a study of the hundreds of education-owned film distribution centres throughout the U.S. and Canada. In order to implement such an ambitious design it is necessary to enlist the sustained cooperation of the centres. The long range payoff-an explicit theory for the management of film distribution--is not likely to motivate such co-operation. Fortunately, there exists the possibility of a more immediate payoff to these centres and their managers, namely, providing them with program budget formats. Program budgets are now required, by executive order, in all federal agencies. In addition, several state and provincial school systems are either in the process of implementing program budgeting or are developing the necessary formats. It is just a matter of time until special service agencies--like a.v. centres- will also be expected to rationalize their expenditures in a program budget format.

In a nutshell, a program budget breaks down allocations according to the

independent factors affecting a system's operation. In the case of film distribution systems, a program, or factor, budget format would make explicit the allocation to each factor affecting the Requirement Booking Rate. Over time, then, changes in the Requirement Booking Rate could be seen as reflections of changes in the factors, in precise dollars-and-cents terms. Thus the relative weights of the factors as they affect the Requirement Booking Rate can eventually be computed and an explicit formula developed. This discussion is, of course, deceptively oversimplified. The data analysis would, in fact, be extremely complex.

The point is that the program budget format would provide the manager with a ready-made document, which he would be required to develop in any case, and would provide us with the most advantageous data-collection procedure. We could construct a format for each manager on the basis of the frame of reference presented earlier. We would require in return nothing more than a duplicate copy of the budget document which he submits to the budget co-ordinating office of the school system.

To sum up, the advantages of such a data-collection procedure are several:

1. The budget statement would contain all of the data necessary to test the distribution model.

2. Data obtained through the formal budget statement is probably more accurate than data obtained through a questionnaire survey.

3. The manager would save time because he is not being asked to construct a separate document or treat data any differently than he must in his budget document.

4. This data-collection system establishes communication linkages which will be used to transmit new findings and accept recommendations from managers.

5. This design provides longitudinal data over a large number of centres. Thus, it will, we believe, be possible to interpolate, rather than extrapolate*, relation statements.

Finally, it might be pointed out that this model is being developed in a university Department of Educational Planning. Now, whatever else the infatuation of planners for program budgeting implies, it also indicates that planning as a paid profession is to an important degree concerned with seeing to it that research related to political and administrative decisions gets done. More specifically, it is concerned with promoting research that managers will understand and appreciate. This means, in turn, that researchers will be influenced as to what questions they deal with, the timing of their studies, the bases of their studies and the units of their analyses, and the format and terminology in which they present their reports. But research cannot be made very relevant to

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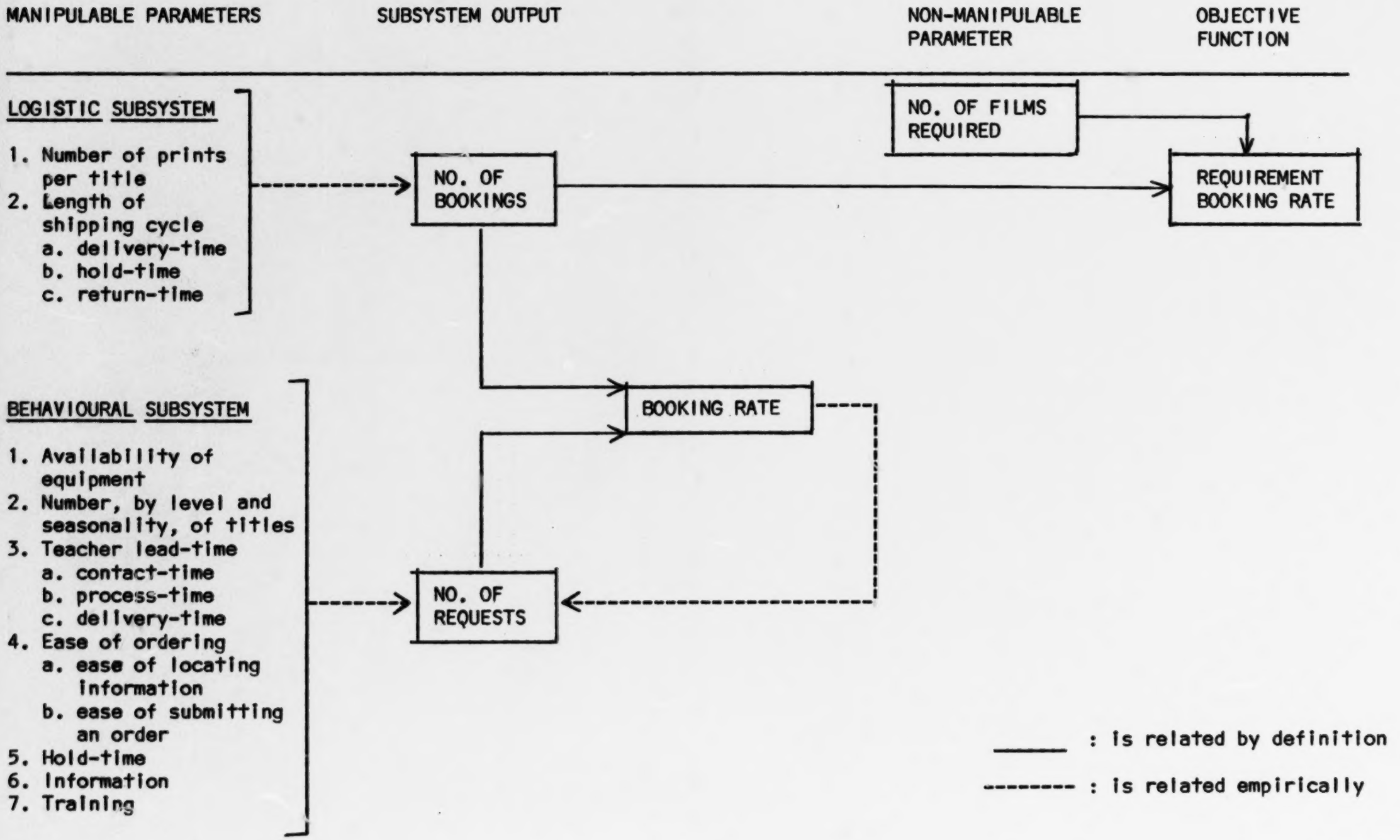
*Interpolation is to estimate the values of a function between two known values while extrapolation is to <u>extend</u> values of a function, on the basis of known values.

management by changing only the behaviour of researchers. It is equally important that managers formulate problems amenable to the present state of the arts, of the kinds of research involved. This is equivalent to saying that to an important degree planning is the re-education and co-education of both managers and researchers.

> "It seems at times that almost every problem of applied science and engineering (which, after all, are goal-directed human activities) can be given an optimizing formulation, and that anything worth doing is worth doing not merely well but optimally". (Sengupta, J.K. and Fox, K.A., 1969, p. 1)

FILM DISTRIBUTION SYSTEMS



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